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LINCOLN
APPLIED GEOLOGY, INC.
ENVIRONMENTAL CONSULTANTS

January 22, 1996

Mr. Blaise Schroeder
Allstate Insurance Company
P.O. Box 486
Williston, Vermont 05495

RE: Dwyer Residence - November 1995 through January 1996 Status Report on Fuel Oil Remediation

Dear Mr. Schroeder:

Lincoln Applied Geology, Inc. (LAG) is pleased to present the following status report regarding the operation and maintenance of the fuel oil vapor extraction system (VES) currently operating at the Mary Dwyer residence at 35 Middlewood Road, Williston, Vermont. There have been no vapor impacts to the residence since the vapor barrier was installed atop the concrete slab beneath the trailer and no impacts to the ground water have been observed. The VES has operated satisfactorily with an estimated equivalent of 48 gallons of product having been recovered in vapor form through the beginning of January 1996. This represents an estimated additional 7 gallons since October 27, 1995. However, only one vapor canister required replacement (November 6, 1995) during the period compared to six canisters up until that point. Since September 1995 influent vapor levels according to PID readings have averaged 16 parts per million (ppm). For a one week period (November 13 - 21, 1995) we shutdown the VES to evaluate equilibrated influent vapor levels upon startup. The influent data showed an initial slight vapor level increase after restarting, but since then has remained relatively stable at 14 to 16 ppm. Based on the low rate of carbon usage, we believe that the actual concentrations of volatiles in the soil gas are much lower than the levels qualitatively assayed with the PID. Therefore we recommend that an air sample of the extracted soil gas be collected for laboratory analysis of the actual concentrations of BTEX and other aromatic compounds. This value can then be compared to the 5 ppm goal for VES shutdown. After collection of this sample we recommend that a longer shutdown of the VES system be tested. During the subsequent monthly site visits vapor levels and ground water levels in the vapor wells will be monitored to ensure no vapor level impacts to the residence and crawlspace. Depending upon the results of air sampling and analysis and whether the monthly data collected shows increasing, stable, or declining vapor trends, the VES system will either be restarted or permanently dismantled.

Enclosed for your information and use are the following tables, charts, figures, and appendices:

Figure 1,	Schematic Site Plan;
Table 1,	Depth to Ground Water;
Table 2,	VES PID Assays;
Table 3,	Remedial System Vapor Flows;
Table 4,	Carbon Unit Pressure Data;
Table 5,	Remedial System Vacuum Data;
Chart 1,	Estimated Vapor Phase Product Recovered;
Chart 2,	AH-5 Ground Water Level Trends;
Chart 3,	AH-1 and 2 PID Trends; and
Chart 4,	AH-3, 4, and 5 PID Trends.

From startup of the VES on February 23, 1995 until the beginning of January 1996 an estimated equivalent of 48 gallons of vapor phase fuel oil product has been recovered as shown in **Chart 1**. A schematic site plan is presented as **Figure 1** showing the layout of the VES, vapor monitoring well array, and the Dwyer residence. Initially, the crawlspace was ventilated with temporary ventilation fans. The continued presence of fuel oil vapors in the basement crawlspace and the trailer required the installation of a 6 mil thick layer of polyethylene film between the concrete slab and the trailer on September 7, 1995. This action has prevented the migration of fuel oil odors/ vapors from the concrete slab upwards into the trailer area even without active ventilation of the crawlspace. Subsequently the temporary ventilation fans were removed from the site.

Ground water data presented in **Table 1** indicates that ground water levels at the site in vapor well AH-5 (only AH-5 penetrates the ground water surface) has continued to rise from the lower levels observed during the past summer's dry spell. The depth of ground water is now less than 20 feet below ground surface. The trend in AH-5 water levels over time is shown in **Chart 2**. Due to the successful operations of the VES, no free phase product has ever been detected floating on the ground water system. The other four vapor wells remain dry since they do not penetrate deeper than 13 feet below grade. The measurements of apparent ground water in AH-1 through AH-4 on some days is due to perched water that occasionally collects in the bottom of the wells.

Vapor levels in the wells as measured by PID are summarized in **Table 2**. The PID level trends are shown on **Charts 3** and **4**. Vapor wells AH-1 and AH-2 continue to show moderate levels of fuel oil related vapors (lately ranging from 2.2 to 17.6 ppm), since they are located closest to the fuel oil spill area. Vapor wells AH-3, AH-4, and AH-5 have contained only very low to background (BG) levels of vapor phase contaminants. Wells AH-1, 2, 3, and 4 are screened in the upper shallow soils to a depth of 11 feet, while well AH-5 is screened at a depth of 11.5 to 20.5 feet. Influent

vapor levels to the granular activated carbon (GAC) VES treatment system have been moderate, ranging from 14 parts per million (ppm) to 22 ppm (average 16 ppm) since October 27, 1995. The VES flow rates are presented in **Table 3**. The one-horsepower Rotron vacuum blower has maintained a total soil vapor flow rate ranging from 62 cubic feet per minute (cfm) to 78 cfm since October 27th.

Chart 1 and **Table 2** shows the trend of the influent PID vapor levels since VES startup, as well as our estimate of the cumulative gallons of vapor phase product recovered. This estimate is based on measured flow rates, measured PID assays, and a conversion factor based on actual product recoveries at numerous other contaminated sites within Vermont. According to this, an estimated 48 gallons of vapor phase fuel oil product has been recovered to date. This may be an over estimate since only seven canisters containing 180 pounds of carbon each have been used. It appears unlikely to us that 1,080 pounds of carbon have adsorbed about 250 pounds of fuel oil vapors. Therefore, the actual vapor concentrations are less than these indicated by PID assays.

The carbon unit pressure data is presented in **Table 4** and reveals that the Rotron blower has maintained 10 to 12.5 inches of water (inches H_2O) pressure on the influent air line into GAC can #1. **Table 5** includes a data summary of the vacuum created by the Rotron blower on the VES. All of the vacuum is applied to AH-1 and AH-2 creating a range from 7.5 to 12 inches H_2O. Vacuums in AH-3, 4, and 5 have been minimal (there is some leakage through the closed ball valves) to zero. The accent on AH-1 and AH-2 has been maintained since only these two wells have contained vapors to be extracted and treated.

A week long VES shutdown test was conducted from November 13 to 21, 1995. Total influent VES soil gas vapor concentrations were 14.8 ppm prior to shutdown. Upon startup a week later the VES influent levels had increased slightly to 22 ppm, but had returned to the pre-test level of 14 ppm by December 6th and remained relatively stable at 14.8 to 16.6 ppm through January 3, 1996. Influent vapor levels have averaged 16 ppm since September 1995.

Our VES influent level shutdown goal has been 5 ppm, a level exceeded based on PID measurements. The data collected on contaminant removal by the GACs suggests that levels may actually be considerably lower. Therefore, soil gas contaminants will be adsorbed onto carbon tubes and laboratory analysis will be performed to better quantify the actual influent vapor levels.

No vapor phase impacts to the basement crawlspace or Dwyer residence have

AH-5 sampled March 9, 1995 Results BPQL

been detected since installation of the vapor barrier in September. No impacts to the ground water have been detected. Shutdown of the VES system for one week did not result in significant influent vapor level increases. As a result of the historical data collected and findings presented to date, we feel it is time to shutdown the VES for a longer time and monitor the vapor well ground water levels, well headspace PID levels, and basement crawlspace and residence PID levels on a monthly frequency. Depending upon the results of the qualitative analysis and vapor level increases remaining stable or declining, we will either restart the VES or permanently dismantle the system and abandon the vapor wells.

We will proceed with the soil gas sampling and shutdown of the VES during the week of January 22nd. If you have any questions or comments, please call me or Alan Moore, P.E., Project Engineer, at 453-4384.

Sincerely,

William D. Norland

William D. Norland
Hydrogeologist

WDN/smk
enclosures
cc: Lynda Provencher
Mary Dwyer

shut down 25th

Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

Project: Dwyer Residence
Location: Williston, Vermont

Depth to Ground Water (feet below well top of casing)

Data Point	08/16/95	08/28/95	09/12/95	09/29/95	10/10/95	10/27/95	11/06/95	11/21/95	12/06/95	12/18/95	01/03/96
AH-1	>13.43	13.07	>13.06	>13.06	>13.32	>13.07		<13.08	<13.31		
AH-2	>11.86	>11.81	<11.85	>11.85	>12.05	>11.80		<11.83	<12.05		
AH-3	>11.04	11.02	>11.00	>11.00	>11.26	>11.02		<11.06	<11.26		
AH-4	>11.38	>11.37	>11.27	>11.27	>11.52	>11.27		<11.31	<11.51		
AH-5	21.63	21.54	21.68	21.99	22.46	21.78	21.19	20.17	19.52	19.25	19.20

Notes:
Light Grey Cell = DRY
Dark Grey Cell = Inaccessible

Project: Dwyer Residence
Location: Williston, Vermont

Photoionization Results (PID - ppm)

Data Point	09/12/95	09/29/95	10/10/95	10/27/95	11/06/95	11/13/95	11/21/95	12/06/95	12/18/95	01/03/96
Trailer	BG	BG	BG	BG	BG		BG	BG	BG	BG
Crawl Space	BG	BG	BG	BG	BG		BG	BG	BG	BG
AH-1	5.4	5.0	5.8	16.8	17.6		11.2	12.4	4.8	4.2
AH-2	9.6	10.4	12.0	9.6	9.6		9.6	2.2	10.8	9.6
AH-3	BG	BG	BG	0.6	0.4		BG	BG	BG	BG
AH-4	BG	BG	BG	BG	1.0		BG	BG	BG	BG
AH-5	1.0	2.8	BG	BG	1.0		BG	BG	BG	BG
Influent into GAC Can #1	19.2	22	8.4	12.6	15.0	14.8	22	14.0	16.6	14.8
Effluent GAC Can #1	0.2	1.0	5.4	10.0	15.0	0.2	0.4	1.8	1.8	2.0
Total Effluent GAC Can #2	BG	BG	BG	BG	BG	BG	BG	0.4	BG	BG
Interval Product Recovered (Gal)	2.16	2.98	0.65	1.44	1.01	0.00	1.36	1.69	1.66	1.97
Total Product Recovered (Gal)	35.28	38.27	38.91	40.36	41.37	41.37	42.73	44.42	46.08	48.04

Notes:
BG - Background
SL - Saturated Lamp
ppm = Parts per Million

Project: Dwyer Residence
Location: Williston, Vermont

Remedial System Flows (cfm)

Data Point	08/28/95	09/12/95	09/29/95	10/10/95	10/27/95	11/06/95	11/13/95	11/21/95	12/06/95	12/18/95	01/03/96
AH-1	34.12	35.22	36.32	31.54	33.45	31.15		35.02	40.58	42.25	41.30
AH-2	34.12	35.22	36.32	28.21	31.29	31.15		33.22	33.65	35.56	35.50
AH-3	0	0	0	0	0	0		0	0	0	0
AH-4	0	0	0	0	0	0		0	0	0	0
AH-5	0	0	0	0	0	0		0	0	0	0
Total Influent before Fresh Air	68.24	70.48	72.65	59.75	64.74	62.29		68.24	74.23	77.80	76.80
Total Influent after Fresh Air	68.24	69.37	69.37	73.71	64.74	62.29		71.57	74.23	76.80	76.80
Influent into GAC Can #1	87.21	76.80	76.80	72.65	62.29	77.80	79.78	69.37	72.65	79.78	78.80
Effluent GAC Can #1	87.21	72.65	72.65	74.75	75.78	77.80	71.57	67.09	73.18	73.71	74.75
Total Effluent GAC Can #2	75.78	72.65	72.65	75.78	73.71	71.57	68.24	67.09	74.75	72.65	72.65

Notes:
cfm = Cubic Feet per Minute

Project: Dwyer Residence
Location: Williston, Vermont

Carbon Unit Pressure Data (inches of H_2O)

Data Point	08/16/95	08/28/95	09/12/95	09/29/95	10/10/95	10/27/95	11/06/95	11/21/95	12/06/95	12/18/95	01/03/96
Influent into GAC Can #1	10	10	11	11	10	10	10	10	10.5	12.5	12
Effluent GAC Can #1	4	4.7	6	6.5	6	6	5	5	5	6	6
Total Effluent GAC Can #2	0.5	1.8	0.4	4	0.26	0.3	0.24	0.5	0.36	0.48	0.44

Project: Dwyer Residence
Location: Williston, Vermont

Remedial System Vacuum (inches of H_2O)

Data Point	08/16/95	08/28/95	09/12/95	09/29/95	10/10/95	10/27/95	11/06/95	11/21/95	12/06/95	12/18/95	01/03/96
AH-1	12	10		10	10	10.2	12	12	12.5	12	11.5
AH-2	12	10		10	10	10	12	10.5	12	7.5	7.5
AH-3	0	0.42	0	0	0	0.5	0.5	0	0	0	0
AH-4	0	0.1	0	0	0	0	0.8	0	0	0	0
AH-5	0	0.74	0	0	0	0.82	0.6	0	0	0	0
Total Influent before Fresh Air	12	12		12	12	10.4	14	16	13	19	18.5
Total Influent after Fresh Air	12	12		12	12	10.4	14	16	13	19	18

Dwyer Residence
Williston, VT

Cumulative Gallons Recovered and Influent PID Trends

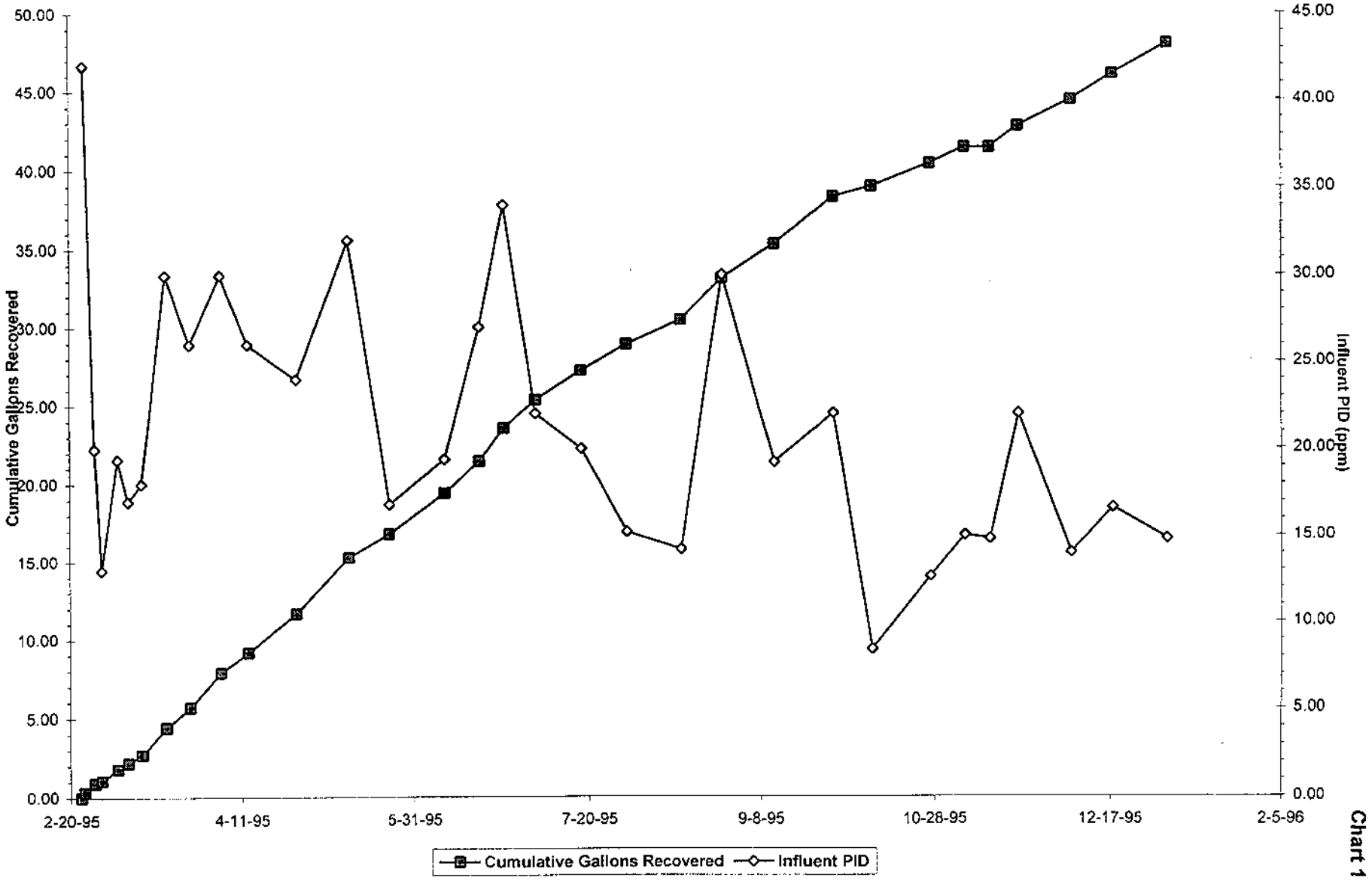

Chart 1

Dwyer Residence
Williston, VT
AH-5 Ground Water Level Trends

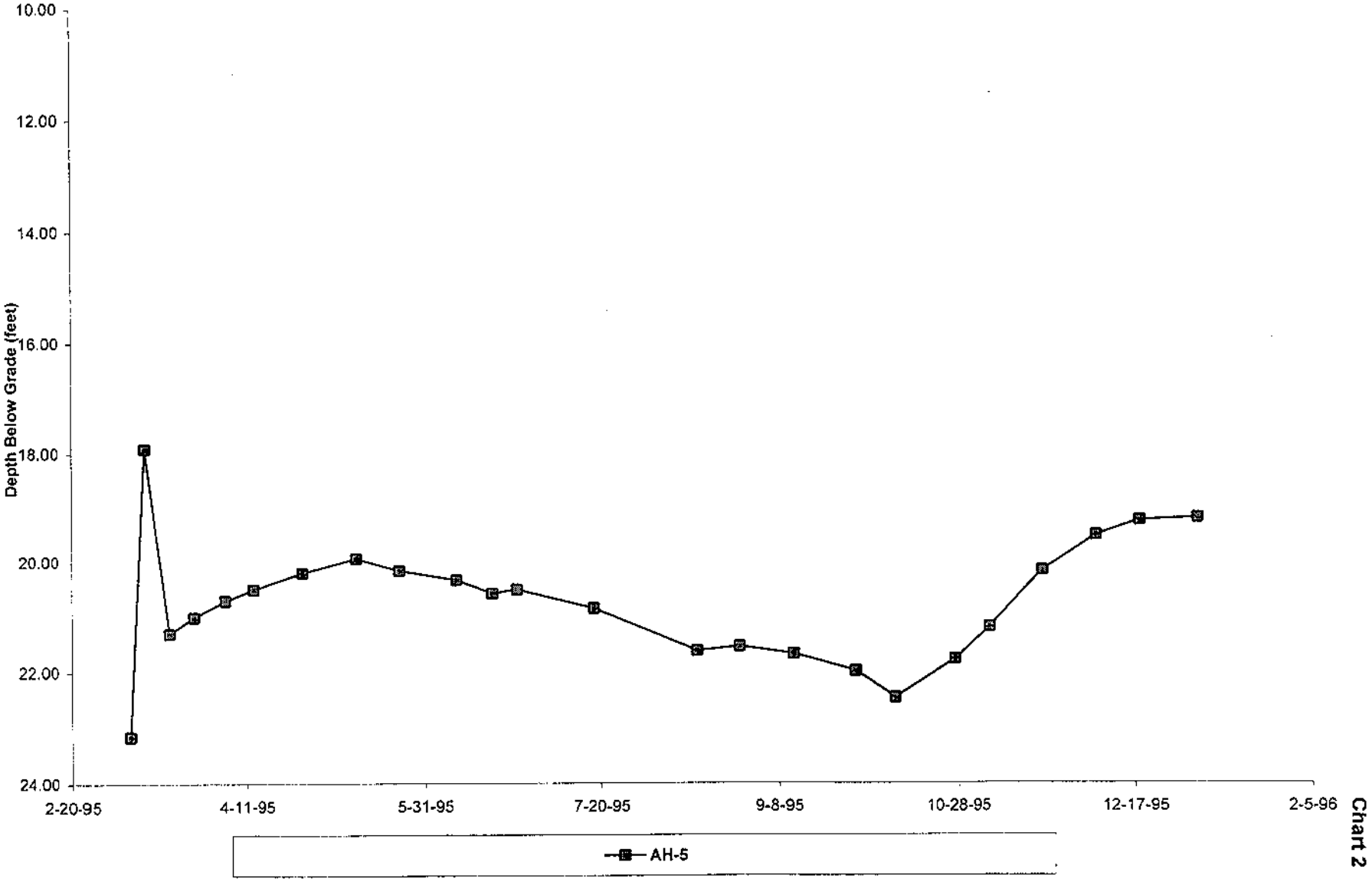

Chart 2

Dwyer Residence
Williston, VT
AH-1, and 2 PID Trends

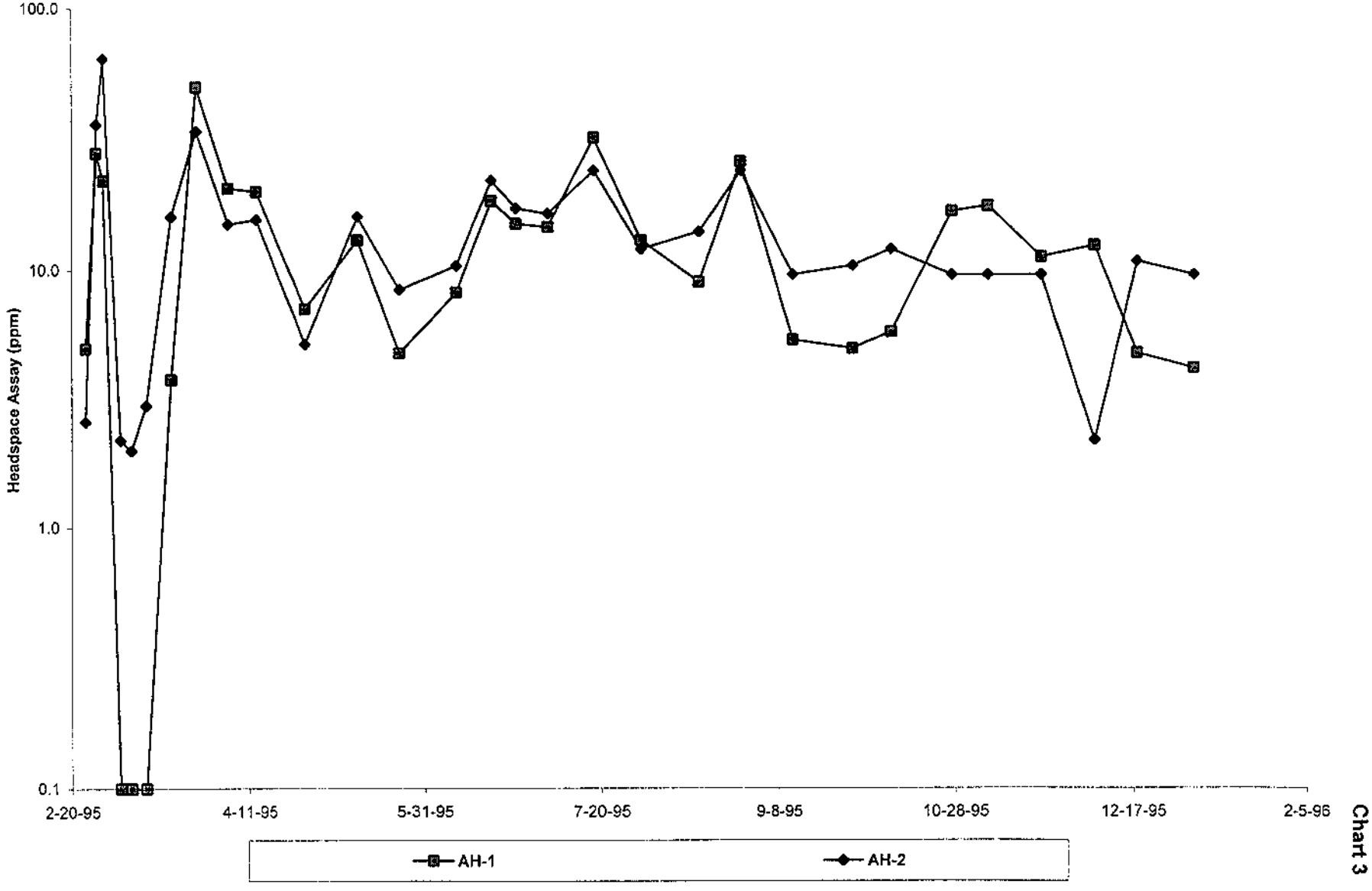

Chart 3

Dwyer Residence
Williston, VT
AH-3, 4, and 5
PID Trends

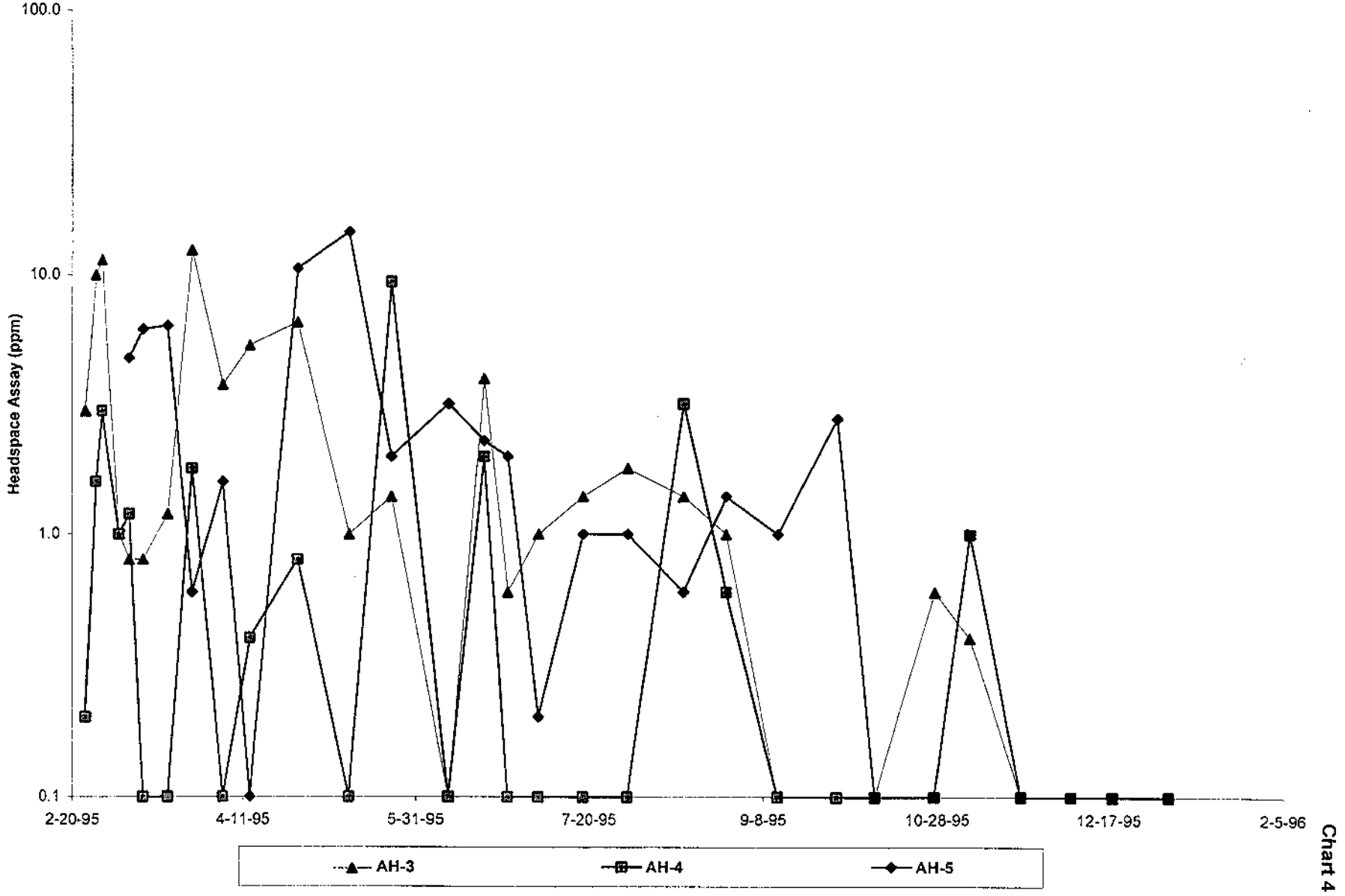

Chart 4

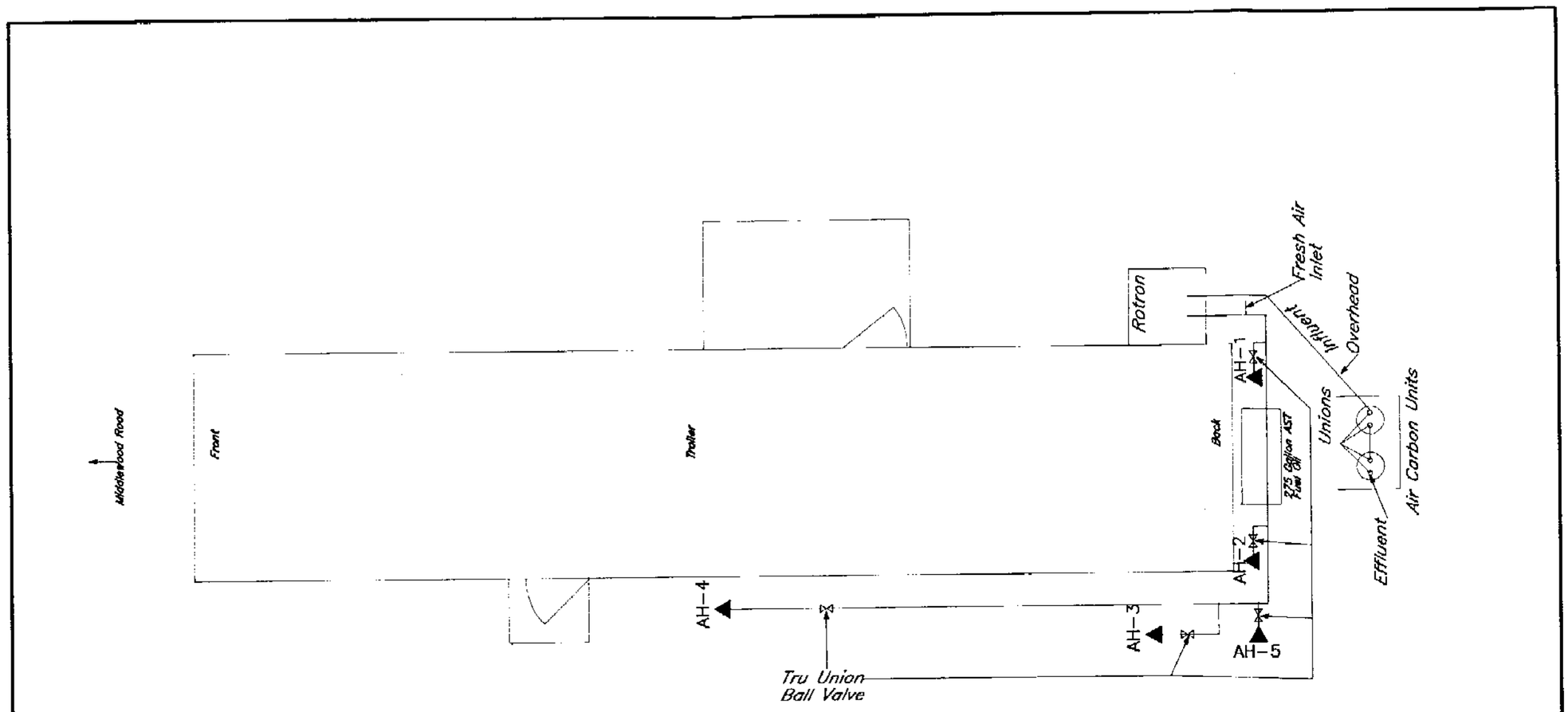

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Figure 1

Dwyer Residence

Location: Williston, Vermont

Scale: NOT TO SCALE

Schematic Site Plan

Date: Feb 1995

Job Type: Petroleum Contamination